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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/785,436

02/20/01

MAEKAWA

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MM21/0925

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EXAMINER

GEYER, S

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 09/25/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

**Office Action Summary**

Application No.

09/785,436

Applicant(s)

MAEKAWA ET AL.

Examiner

Scott Geyer

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 August 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 25-48 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 38 is/are allowed.
- 6) ☒ Claim(s) 25-37 and 40-43 is/are rejected.
- 7) ☒ Claim(s) 39 and 44-48 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 February 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 08/981,702.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 & 6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Election requirement has been withdrawn due to applicant's amendment in paper No. 7

### ***Drawings***

2. The drawings as submitted on 20 February 2001 are acceptable.

### ***Specification***

3. The specification as submitted is acceptable.

### ***Claim Objections***

4. Claims 39 and 44-48 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim should refer to other claims in the alternatively only and cannot depend from any other multiple dependent claim. See MPEP § 608.01(n). Accordingly, the claims 39 and 44-48 have not been further treated on the merits.

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 25-28, 32-34 and 40-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morita et al. (5,406,124).

Morita et al. teach a semiconductor device consisting of a support member, a semiconductor chip and an attaching member. The die-bonding film is constructed of epoxy resin, acrylic resin or a polyimide based film (column 1, lines 43 et seq.). The attaching member is a cured product (column 1, lines 61 et seq.).

Further, the film has an elastic modulus ranging from  $10^2$  dyne/cm<sup>2</sup> to  $10^9$  dyne/cm<sup>2</sup> at least at a temperature of 250°C to 300°C (column 4, lines 30 et seq.). Morita et al. also teaches a water absorption ratio less than 1.2% (column 9, lines 14 et seq.) and a solvent (volatile) component less than 1% (column 10, lines 1 et seq.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Morita et al. to produce a semiconductor device as in applicant's claims 25-28, 32-34 and 40-43.

7. Claims 29, 31, 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morita et al. (5,406,124) in view of Yusa et al. (5,605,763).

Morita et al. teach a semiconductor device consisting of a support member, a semiconductor chip and an attaching member. The die-bonding film is constructed of epoxy resin, acrylic resin or a polyimide based film (column 1, lines 43 et seq.). The attaching member is a cured product (column 1, lines 61 et seq.).

Morita et al. do not teach a peel strength of 0.5 Kgf/5 x 5 mm chip or above at a stage where the chip has been bonded to the support member as in applicant's claim 29 and 36, nor do Morita et al. teach using film of similar dimension as the chip to which the film is to be bonded.

However, Yusa et al. does disclose peel strengths above 0.5 Kgf for a piece as large as 8x8mm (column 14, lines 26 et seq. and also Table 10). Yusa et al. further teaches attaching conductive bonding film pieces to semiconductor chips of similar dimensions, including: film of 4mm x 4mm and chip of 4mm x 4mm (column 13, lines 18-20) and film of 8mm x 8mm and chip of 8mm x 8mm (column 14, lines 26-28).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Morita et al. and Yusa et al. to produce a semiconductor device as in applicant's claims 29 and 36. It would also have been obvious to one of ordinary skill in the art at the time of the invention to use a bonding film of particular dimension to a chip of the same dimension, as in applicant's claims 31 and 37 such that no film needs to be removed as waste after bonding is completed.

**8.** Claims 30 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morita et al. (5,406,124) in view of Schuft (5,605,763).

Morita et al. teach a semiconductor device consisting of a support member, a semiconductor chip and an attaching member. The die-bonding film is constructed of epoxy resin, acrylic resin or a polyimide based film (column 1, lines 43 et seq.). The attaching member is a cured product (column 1, lines 61 et seq.).

Morita et al. do not teach a void volume of less than 10% for voids in the die bonding material.

However, Schuft does teach a void volume of 10% or less (column 4, lines 6 et seq.) for adhesive material, or thermal conduit (column 2, lines 42 et seq.).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Morita et al. and Schuft to produce a semiconductor device as in applicant's claims 30 and 35.

***Allowable Subject Matter***

**9. Claim 38 is allowed.**

The following is a statement of reasons for the indication of allowable subject matter: Morita et al. (5,406,124) teach a semiconductor device consisting of a support member, a semiconductor chip and an attaching member. The die-bonding film is constructed of epoxy resin, acrylic resin or a polyimide based film (column 1, lines 43 et seq.). The attaching member is a cured product (column 1, lines 61 et seq.). Morita et al. further teach a bonding time of 0.1 to 10 seconds (column 14, lines 7 et seq.).

Tomita et al. (5,698,891) teach a die bonding temperature range of 100°C to 300°C (column 12, lines 1 et seq.).

However, neither Morita et al. or Tomita et al. teach a bonding pressure of 0.1 to 4 gf/mm<sup>2</sup>.

***Conclusion***

**10.** Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott Geyer whose telephone number is (703)306-5866. The examiner can normally be reached on weekdays, between 9:00am - 5:30pm. The examiner may also be reached via e-mail: [scott.geyer@uspto.gov](mailto:scott.geyer@uspto.gov).

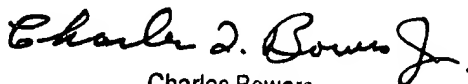
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles L. Bowers can be reached on (703)308-2417. The fax phone

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numbers for the organization where this application or proceeding is assigned are (703)305-0142 for regular communications and (703)308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

sbg  
September 21, 2001



Charles Bowers  
Supervisory Patent Examiner  
Technology Center 2800